Far IR, Sub-MM & MM Detector Technology Workshop Summary

The millimeter, sub-millimeter and far-IR span the range of wavelengths where most of the astrophysical radiation in our universe is emitted. At the long wavelength end, the study of Cosmic Microwave Background Radiation is the central element to our understanding of the beginning of cosmic structure formation. In the sub-millimeter much of the chemistry and energetics in our own galaxy is observed. The sub-millimeter also reveals the full history of formation and evolution of galaxies over cosmic time. In the far-infrared, the details of the star formation process can be witnessed. The search for extra-solar planets and the study of the conditions for planet formation are also carried out at mid-infrared wavelengths.

Yet the maturity of the detector technology in this important spectral range is low. Furthermore, the programs in place to support and nurture future detector development are not commensurate either with the plans for future space missions nor with the scientific potential available. Current technology operates far from fundamental limits in much of the band. Integration of large-scale imaging capabilities is only just beginning. Unlike much of the rest of the electromagnetic spectrum, several orders of magnitude improvement in sensitivity and throughput remain to be gained for future instruments and future space missions.

In part, this results from the fact that low-background instrumentation at wavelengths longer than the thermal IR has little direct use in industrial and military applications. The burden of the development of whole technologies falls directly on the astrophysics community from the study of the fundamental physics of the detection process to the engineering problems of large-scale integration of focal planes operating at cryogenic temperatures. Few resources exist within the infrastructure of scientific research in the US and worldwide to directly foster research in detectors and these few fall far short of keeping up with the needs of future, highly visible missions. It therefore often falls to missions themselves to develop and engineer new generations of detectors sometimes starting only with basic principles and simple prototypes.

To improve on this disjointed approach, the Astronomy and Physics Division of the Office of Space Science (OSS) at NASA chartered the Infrared, Submillimeter, and Millimeter Detector Working Group (ISMDWG) to develop a road map on the detector developments required to enable the mis-

sions defined in the NASA Astronomical Search for Origins (ASO) and Structure and Evolution of the Universe (SEU) Themes. The report can be found at /http://www.sofia.usra.edu/det_workshop/report/report.html.

In order to provide broad input to the ISMDWG report, the *Far-IR, Sub-MM & MM Detector Technology Workshop* was convened in Monterey, California on April 1-3, 2002. The workshop was divided into a session on the science of the wavelength band followed by five sessions on different detector technologies. Leadoff presentations aimed at summarizing the status of the technology were followed by contributed talks and posters which were solicited from the community. Short written contributions were required for both talks and posters and these have been edited and included in this proceedings.

The workshop was an unqualified success. The breadth and depth of the contributions and the nearly unlimited range of ideas for future development clearly illustrated the quality of the research and the health of the detector community. The potential for future development is bright indeed.

The aim of these proceedings is to distribute the presentations of the workshop to the ISMDWG and to the whole community. We hope that it will serve as a useful reference to current developments in the field as it has already done for me. The charge given to the authors was to provide a short assessment of the capabilities and future prospects of technologies of their work. The emphasis was to be on a technical description even at the cost of pedagogy and completeness. I believe the authors succeeded admirably.

I would like to extend my sincere thanks for the many people who made this workshop a success. Thanks to the participants who uniformly provided excellent presentations and proceedings contributions, to the scientific organizers whose care and judgement brought everyone together, and most importantly to the local organizing committee and staff which provided an excellent site and facility and kept everyone together for this delightful meeting. Thanks also to the sponsoring organizations, NASA Ames Research Center and the SOFIA Office of Universities Space Research Association (USRA), and for the endorsement of the meeting by NASA Headquarters and the German Aerospace Center, DLR.

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